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SDEC Partners Research Update

Project Update: Swine influenza virus risk factors in growing pigs

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Background

- Influenza A virus (IAV) is considered to play a primary role in polymicrobial respiratory disease events in pigs
- Risk factor studies based on serologic data have generated valuable information regarding the epidemiology of influenza in swine. The presence of anti-influenza antibodies has been associated with high farm density, farm type, herd size, female replacement rates, pen density, uncontrolled access of individuals and indoor housing. Indirect routes (aerosol, fomites) have been suspected in field outbreaks of IAV; however, limited research exists assessing these routes in pigs.
- There have been no risk factor studies associating the presence of IAV with farm level characteristics.

Objective

The objective of this study was to investigate whether certain farm level risk factors were associated with the presence of IAV in growing pigs.

Results

- At the individual level, 4.6% of the nasal swabs from growing pigs tested positive for IAV.
- Of the monthly groups of pigs from which nasal swabs were collected, 20.8% had at least one positive nasal swab.
- Positive nasal swabs originated from 23 of the 26 participating farms.
- Farm type, pig flow and gilt source were associated with the presence of IAV.
- Environmental temperature and wind speed were associated with the presence of IAV.

Results

Risk Factor	Odds Ratio	95% CI	P
Farm type			
Finisher (Referent)	-	-	-
Farrow-to-finish	3.05	1.56-5.95	<.001
Wean-to-finish	0.89	0.44-1.80	.76
Nursery	16.69	5.34-52.18	<.001
Gilt developer unit	1.11	0.31-3.94	.86
Nursery-finisher	0.78	0.33-1.82	.58
Sow vaccination for influenza	1.09	0.31-3.75	.89
Number of barns on site	1.036	0.89- 1.20	.64
Barn ventilation			
Natural and mechanical (Referent)	-	-	-
Natural ventilation	0.559	0.17-1.77	.32
Mechanical ventilation	1.331	0.52-3.40	.55
Topography - Gentle rolling hills	0.769	0.30-1.94	.56
Absence of trees surrounding the site	0.724	0.24-2.13	.56
Number of pig farms within 1 mile	1.015	0.70- 1.46	.94
Distance to closest pig farm	0.863	0.62-1.19	.37
Distance to closest road	0.891	0.71-1.10	.30
Drinking water chlorinated	1.566	0.52-4.70	.42
Drinking water acidified	1.566	0.52-4.70	.42
Recycled lagoon water for flush or recharge	1.080	0.11-9.88	.95
Number of employees at the site	1.042	0.88-1.22	.62
Entrance sanitation procedure			
Shower in and clothes changed (Referent)	-	-	-
No measures	0.399	0.10-1.56	.19
Boot wash and disinfection	0.544	0.11-2.67	.45
Coverall and boot change, hands washed	0.440	0.16-1.19	.11
Employee restrictions on visits to other pig farms	0.877	0.37-2.03	.76
Downtime required for employees after visiting other pig farms	1.199	0.74-1.93	.46
Downtime required for visitors	1.126	0.67-1.86	.64
Frequency of veterinary visits	0.977	0.93-1.02	.34

Table 1. Farm level factors associated with the presence of influenza A virus in swine farms in the Midwestern United States. (Corzo 2012)

(continued)	Risk Factor	Odds Ratio	95% CI	P
Pig flow				
Continuous flow (Referent)	-	-	-	-
All-in All-out by barn	0.309	0.14-0.66	.002	
All-in All-out by site	0.359	0.14-0.88	.03	
Number of sow herds supplying pigs	1.513	0.59-3.82	.40	
Sow herd size	1.0	1.0-1.0	.31	
Number of workers at the sow herd	0.974	0.90-1.04	.46	
Growing pigs vaccinated for influenza	1.143	0.27-4.78	.85	
Gilt source				
Bom at breeding site and never moved from that site (Referent)	-	-	-	
Bom at breeding site and moved to another site and later returned	0.175	0.04-0.63	.008	
Multiplier	0.256	0.09-0.68	.007	
Presence of migratory birds within 1 mile radius of the site				
Frequently (once per month)(Referent)	-	-	-	
No	1.489	0.38-5.81	.57	
Rarely (less than once every 6 months)	2.122	0.70-6.37	.18	
Occasionally (every 3 to 6 months)	1.708	0.53-5.50	.37	
Presence of feral pigs near the site	1.590	0.20-12.14	.65	
Presence of birds inside buildings	0.767	0.33-1.74	.53	
Use of insecticides on building exterior	1.740	0.55-5.49	.34	
Presence of other animals in the farm	1.586	0.72-3.45	.24	

Table 2. Meteorological factors associated with the presence of influenza virus in growing pigs. (Corzo, 2012)

Variable	Odds Ratio	95% CI	P
Temperature (°C)	1.027	0.999, 1.056	.06
Relative humidity(%)	0.965	0.937, 0.995	.02
Light intensity (watts/m ²)	1.006	1.001, 1.010	.02
Wind direction (Ø degrees)	0.993	0.984, 1.002	.11
Wind speed (kph)	1.175	1.026, 1.346	.02
Wind gusts (kph)	1.132	1.024, 1.250	.02

Conclusions

- Growing pigs on farms where sows are present or where replacement gilts are raised on site are at higher risk of testing positive for IAV when compared to finishing farms or farms that introduce replacement gilts from outside sources.
- Management practices such as AIAO may reduce the likelihood that pigs test positive for IAV.
- It is not well understood how meteorological variables outside the barn influence the occurrence of IAV inside the pig barn and more research is needed to fully understand the relationships between weather and IAV in pig populations.

Implications

- This study provides insights into the ecology of IAV which can aid in the construction of control and prevention strategies.
- Efforts into managing closed populations should be performed to decrease virus transmission and persistence.